

A REVIEW OF THE SPECIES OF *HEMILEPISTUS*
S. STR. BUDDE-LUND, 1885 (ISOPODA,
PORCELLIONIDAE)



BY
ROGER JOHN LINCOLN

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A REVIEW OF THE SPECIES OF *HEMILEPISTUS* S. STR. BUDDE-LUND, 1885 (ISOPODA, PORCELLIONIDAE)

By R. J. LINCOLN

SYNOPSIS

A brief historical review of relevant literature is given. At the present time the genus *Hemilepistus* is divided into two sub-genera, *Desertellio* and *Hemilepistus* sensu-stricto. The latter group is dealt with in this paper. The sub-genus *Hemilepistus* contains nine recognised species, with a range of distribution from North Africa, through the Near Eastern countries, into central Asia. A diagnosis, with figures, is given for each species, together with a key for their identification. Details of distribution are provided in each case. The synonymy for each species is presented. Where possible type material has been studied, and the locations of the types are indicated in the lists of material examined.

INTRODUCTION

BUDDE-LUND (1879) proposed the division of the genus *Porcellio* Latreille into seven sub-genera, but did not give any descriptive details of these divisions until the publication of his monograph on terrestrial isopods in 1885. As erected by Budde-Lund, the sub-genus *Hemilepistus* contained 10 species, of which 4 were newly described.

The earliest description of a terrestrial isopod which can be attributed to *Hemilepistus* is found in an account of a journey through Russia by Pallas (1771). Further species are contained in the beautifully illustrated account of the fauna of Egypt compiled by Audouin and Savigny (1826), and amongst the crustacean fauna of Turkestan described by Uljanin (1875). Brandt (1833) and Milne-Edwards (1840) published lists of the species of *Porcellio* known at that time, and included a number of new species which were later placed under *Hemilepistus*.

Budde-Lund (1885) split the species of *Hemilepistus* into two groups, each of 5 species, on the basis of the presence or absence of a median frontal line between the frons and the epistome. Verhoeff (1930) used this character to erect two new sub-genera, *Hemilepistus* and *Desertellio*. This raised *Hemilepistus* Budde-Lund to generic status, a move which appears to have been adopted much earlier by Budde-Lund and Stebbing (1911). In a subsequent account of isopods from the Mediterranean coasts, Verhoeff (1931) describes two new species of *Hemilepistus*, but he makes no mention of the sub-genera which had been proposed. Arcangeli (1932) considers a number of the species of *Hemilepistus* to be invalid and arrives at a lengthy synonymy under *crenulatus* Pallas.

More recently some Russian zoologists have made studies of this group of terrestrial isopods with a special interest in their biology and ecology. Borutzky (1945) gives a description of the woodlice fauna of Turkmeniya and central Asia, and produces

the first key for identification of the species of that area. He adopts the sub-genera of Verhoeff, and adds a further five new species. In a subsequent paper on *Hemilepistus*, Borutzky (1958) gives another key and drawings of a number of species. However, this account differs in many respects from the earlier paper and indicates Borutzky's uncertainty about the validity of some members of the genus.

In undertaking this review of the sub-genus *Hemilepistus* s. str. the type material has been examined wherever possible. Much of the Budde-Lund collection is held in the British Museum (Natural History), together with a number of the Verhoeff syntypes. The location of other type material is given in the relevant parts of the text.

Hemilepistus Budde-Lund, 1879

Body long, convex, grey or greyish-brown in colour with lighter tuberosity ; head and anterior peraeon tergites with armature of conical tubercles, which may be small and rounded or developed into large prominent crests ; lateral lobes on head small and set at an oblique angle ; eyes large, convex ; median frontal lobe on head small or absent ; pleon small, narrower than peraeon, smooth dorsally ; telson triangular with rounded apex ; antenna 2 short, with strongly developed peduncle and small, two segmented flagellum ; exopods of pleopods large, expanded ; 2-5 prs of pseudo-tracheae.

KEY TO THE SUB-GENERA OF *Hemilepistus*

- | | | |
|---|---|-----------------------------|
| 1 | Frontal median lobe of head absent | <i>Hemilepistus</i> s. str. |
| 2 | Frontal median lobe present, either entire or cleaved in the centre | <i>Desertellio</i> Verhoeff |

Hemilepistus (Hemilepistus) Budde-Lund, 1879

Body elongate, slate grey or brown with tubercles lighter in colour ; head with well defined pattern of conical tubercles on dorsal side, sometimes a number of additional smaller tubercles within basic arrangement ; lateral lobes of head oblique with small projecting upper lobes ; median lobe and suture line absent ; peraeon tergites 1-3 with well developed tubercles along posterior and lateral margins ; tubercles may form prominent crests ; (arrangement of tubercles on lateral and posterior margins of tergites 1-3 is expressed numerically as the "Dental formula") ; peraeon tergites 4-7 smooth ; peraeon tergite 1 with prominent antero-lateral projection of epimera, apex pointed or acutely rounded ; pleon short, smooth, and with pointed, backwardly directed, epimera ; telson triangular, usually with slight dorsal depression, margins either straight or concave ; antenna 1 very small ; antenna 2 short, reaching only as far as posterior edge of peraeon tergite 1, peduncle strongly developed, segment 2 usually with prominent inner lobe, segment 5 elongate ; flagellum markedly shorter than last segment of peduncle ; flagellum segments either sub-equal, or segment 1 longer than segment 2 ; mandible large, 4-7 penicilli (fig. 1*k*) ; maxilla 2 small, bilobed (fig. 1*l*) ; maxilla 1 and maxillipeds strongly developed (figs. 1*i*, *j*) ; peraeopod 1, ♂ (fig. 1*b*) small, basis long, merus and carpus with long spines ; peraeopod

7, ♂ (fig. 1a) large, with elongate segments and prominent spines; exopods of pleopods 1-5 (figs. 1c-g) large, expanded and with pseudotracheae; pseudotracheae on exopods 1-2 large, 3 small, 4-5 rudimentary; uropods short, conical (fig. 1h); body size, length 10-30 mm, width 4.0-10.5 mm.

At the present time there are 9 species recognised within the sub-genus *Hemilepistus* s. str.

1. *H. (H.) klugii* (Brandt, 1833)
2. *H. (H.) crenulatus* (Pallas, 1771)
3. *H. (H.) reaumuri* (Audouin & Savigny, 1826)
4. *H. (H.) cristatus* Budde-Lund, 1879
5. *H. (H.) magnus* Borutzky, 1945
6. *H. (H.) reductus* Borutzky, 1945
7. *H. (H.) rhinoceros* Borutzky, 1958
8. *H. (H.) aphganicus* Borutzky, 1958
9. *H. (H.) schirasi* n. sp.

An important taxonomic character for the separation of the species is the arrangement of tubercles on the head and peraeon tergites. Although this is a satisfactory criterion, care must be exercised when attempting to identify a particular specimen as the degree of development of the tubercles varies with the size of the animal. The peraeon tubercles can be small and conical, or they may be much larger and form tall, comb-like crests. The shape of the telson also varies with the size of the individual. The juvenile form is usually a regular triangle, taking on the adult shape as the size of the animal increases.

Budde-Lund describes one of his species—*pectinatus*, from a single female specimen, making special reference to a marked suture line between the tergites and epimera of peraeon segments 2-4. Omer-Cooper (1923) remarks upon the same feature in a collection of female *Hemilepistus* from Mesopotamia, and places them in *pectinatus* Budde-Lund. However, Tait (1916) has pointed out that these suture lines do in fact appear in the cuticle of terrestrial isopods over a short period during a moult. Examination of the *Hemilepistus* material has revealed suture lines in several species including *klugii*, *crenulatus*, *reaumuri* and *aphganicus*.

1. *Hemilepistus (H.) klugii* (Brandt, 1833)

(text-figs. 1a-1, 2a-e)

Porcellio klugii Brandt, 1833 : 179; Milne-Edwards, 1840 : 171.

Hemilepistus klugii; Budde-Lund, 1879 : 4; 1885 (part) : 152; Borutzky, 1951 : 162, fig. 1; 1958 : 1464, fig. 2.

Hemilepistus crenulatus; Arcangeli, 1932 (part) : 1.

MATERIAL EXAMINED. 1 ♂, length 18 mm, width 6.5 mm. Syntype, collected by Olivier in the region of the Caucasus. Berlin Museum, cat. no. 7083.

1 ♂, 1 ♀, length 19-20 mm, width 7.0-7.5 mm. Budde-Lund collection from Tehran. B.M. (N.H.), reg. no. 1921.10.18, 4110-4111.

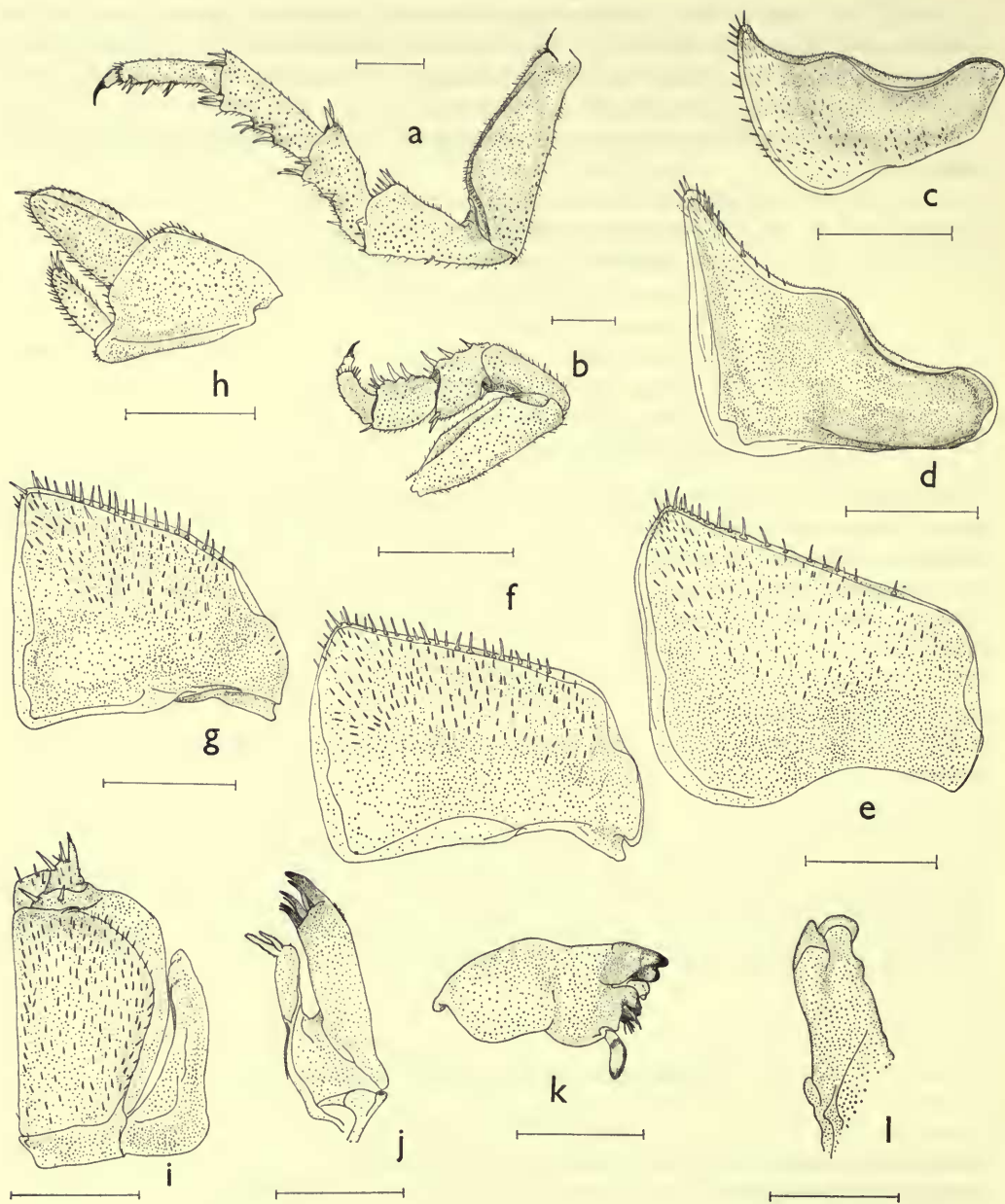


FIG. 1. *Hemilepistus klugii* (Brandt) ; *a*, 7th peraeopod (left) ; *b*, 1st peraeopod (left) ; *c-g*, exopods of pleopods 1-5 (left) ; *h*, uropod (left) ; *i*, maxilliped (left) ; *j*, maxilla 1 (left) ; *k*, mandible (right) ; *l*, maxilla 2 (left) ; bar scale 1 mm.

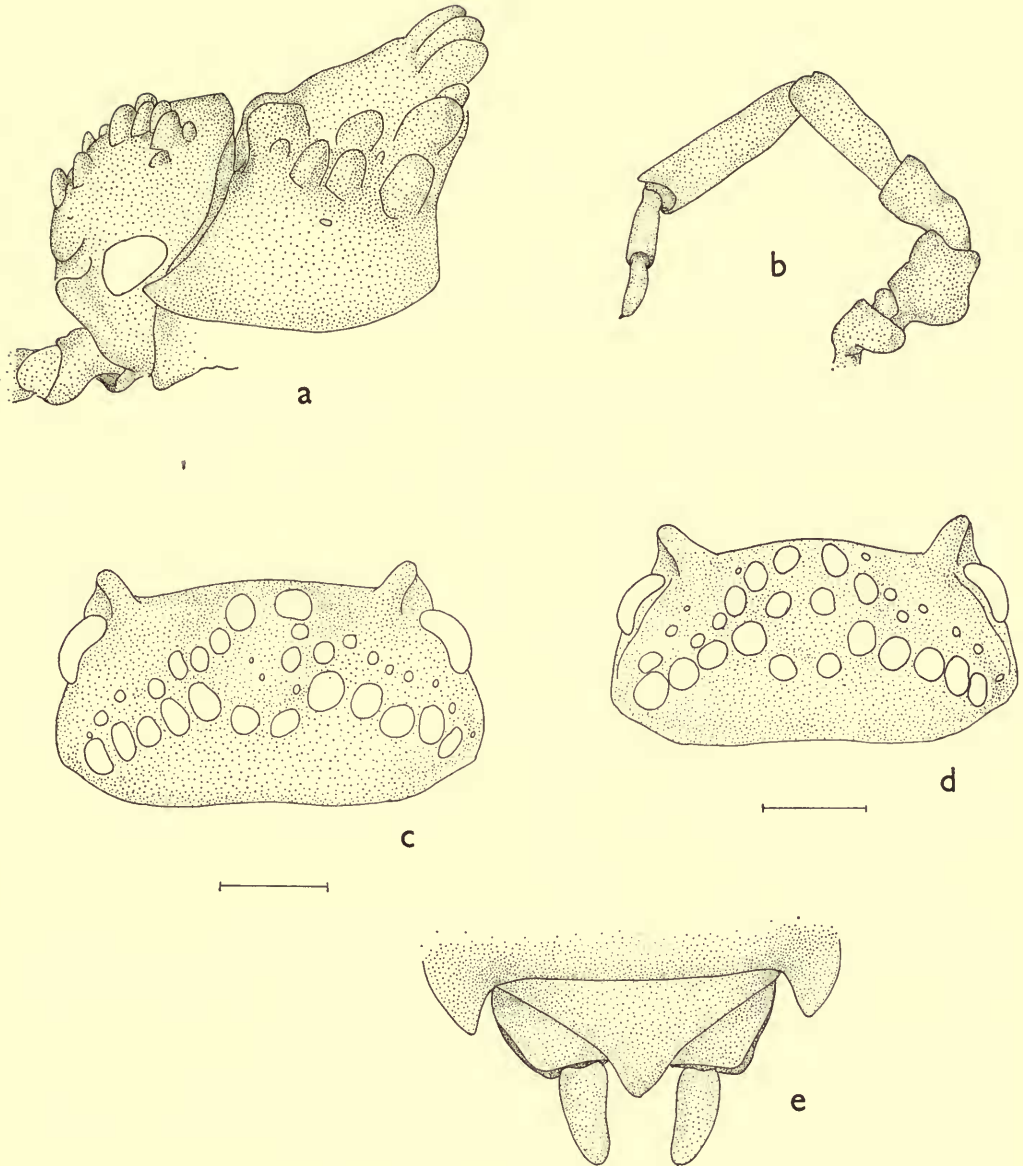


FIG. 2. *Hemilepistus klugii* (Brandt) ; a, lateral view of head and tergite 1 ; b, antenna 2 ; c, dorsal view of head (Syntype) ; d, dorsal view of head ; e, telson ; bar scale 1 mm.

1 ♂, 2 ♀♀, length 14–20 mm, width 5.5–7.5 mm. Budde-Lund collection from the Caucasus. B.M. (N.H.), reg. no. 1921.10.18, 4106–4109.

1 ♂, 1 ♀ (3 juveniles), length 13–15 mm, width 4.5–5.0 mm. Budde-Lund material, collected by Walter in Ashkhabad. B.M. (N.H.), reg. no. 1921.10.18, 4097–4101.

4 ♂♂, 6 ♀♀, length 14–19 mm, width 5.5–7.5 mm. Collected in the Caucasus. Leningrad Museum. Cat. no. 1677.

DIAGNOSIS. Body broad, length 13–20 mm, width 4.5–7.5 mm, greyish-brown with tubercles and epimera paler in colour; peraeon somewhat rectangular, tergites 5–7 slightly broader than rest; head with 16–20 rounded tubercles in a characteristic pattern over a triangular area; pattern consists of large circle in middle of head with lateral rows of 3–4 tubercles extending to postero-lateral corners (fig. 2c, d); sometimes 1–2 tubercles in centre of the large circle and a number of smaller tubercles within the triangular area; head with prominent lateral lobes, upper part of lobes rounded, outer edges sinuous (fig. 2a); ratio of width of head to width of peraeon tergite 2 is about 1 : 1.8; peraeon tergite 1, antero-lateral projection of epimera short, only slightly upturned and with rounded apex (fig. 2a); peraeon tergites 1–3 with short, conical tubercles along posterior and lateral margins; outer tubercles along posterior margin more bulbous than inner ones, those on tergite 1 set at right angles to dorsal surface; posterior edge of tergite 1 strongly developed; tubercles on tergites 2–3 projecting backwards parallel to dorsal surface; peraeon lateral tubercles prominent, anterior tubercle on tergite 1 largest, flattened and rectangular; tergite 4 with only faint traces of tuberosity; tergites 5–7 smooth; (dental formula, tergite 1, 3–4, 14, 3–4; tergites 2 & 3, 2–3, 14, 2–3); in large specimens tubercles on tergites 1–3 may form prominent crests; telson triangular with shallow dorsal depression, lateral margins concave (fig. 2e); antenna 2, peduncle segment 2 with large inner lobe, flagellum about $\frac{2}{3}$ length of peduncle segment 5, flagellum segment 1 longer than 2 (fig. 2b); mandibles (fig. 1k), maxillules (fig. 1j), maxillae (fig. 1l), maxillipeds (fig. 1i), peraeopods 1 (fig. 1a), and peraeopods 2 (fig. 1b), as figured; exopods of pleopods 1–5 ♂ (fig. 1c–g), pseudotracheae on pleopods 1–2 very well developed, small on 3 and rudimentary on 4–5; exopods of pleopod 1 ♂, with strongly sinuous posterior margin and prominent rounded inner angle (fig. 1c).

DISTRIBUTION. Caucasus; Apsheron peninsular; northern Iran.

REMARKS. Budde-Lund (1885) gives two separate localities for the distribution of *klugii*. The first is "Caucasus" from material in the Berlin Museum, and the second is "Schiras in Persia" based upon three specimens in the Copenhagen Museum. Both of these collections have been examined and it is clear that they represent quite different species. The material from the region of the Caucasus is the true *klugii*. The other specimens from Iran will be described later as a new species. Borutzky (1958) was the first to place doubt on the validity of the Budde-Lund *klugii* from Schiras and included it in a list of species of uncertain taxonomic position, but without giving any reasons.

2. *Hemilepistus (H.) crenulatus* (Pallas, 1771)

(text-figs. 3a–h)

Oniscus crenulatus Pallas, 1771 : 477.

Porcellio crenulatus; Latreille, 1804 : 46.

Porcellio elegans Uljanin, 1875 : 6.

Hemilepistus elegans ; Budde-Lund, 1879 : 4 ; 1885 : 154 ; Borutzky, 1945 : 195.

Hemilepistus crenulatus ; Budde-Lund, 1885 : 153 ; Arcangeli, 1932 (part) : 1 ; Borutzky, 1958 : 1465.

Hemilepistus pectinatus Budde-Lund, 1885 : 153 ; Borutzky, 1945 : 195 ; 1958 : 1467.

MATERIAL EXAMINED. 2 ♂♂, length 14 mm, width 4.5 mm. Syntypes of *elegans* Uljanin, collected in valley of Syr-darya, Turkestan. Berlin Museum, cat. no. 6630 (figs. 3*b*, *d*, *g*).

1 ♂, (1 juvenile), length 16.5 mm, width 5.0 mm, collected by Dr. Pawlowsky in Turkestan. B.M. (N.H.), (figs. 3*a*, *c*, *e*, *f*), reg. no. 1916.12.2, 3-4.

1 ♂, (damaged) collected at Schrenck, Kazakhstan. Leningrad Museum, cat. no. 1737.

1 ♀, length 15.0 mm, width 5.0 mm. Holotype of *pectinatus* Budde-Lund, collected at Schrenck, Kazakhstan. Leningrad Museum, cat. no. 1769.

2 ♂♂, length 14-15 mm, width 4.5-5.0 mm. Budde-Lund collection from Turkestan. B.M. (N.H.), reg. no. 1921.10.18, 4095-4096.

DIAGNOSIS. Body long and narrow, length 14-16.5 mm, width 4.5-5.0 mm ; colour dark grey with pale yellow tubercles. Size of tubercles varies considerably with body size, figs. 3*a*, *c*, *e*, *f* are of large male specimen with strong tuberosity ; figs. 3*b*, *d*, *g* of smaller specimen with weak tuberosity ; head with 10-12 tubercles, 6 forming a semi-circle in the middle with 2-3 in rows extending towards postero-lateral corners of head (figs. 3*c*, *d*) ; very few additional tubercles developed on head ; on large specimens head-tubercles strong, conical and pointed ; smaller specimens with weak, rounded tubercles ; lateral lobes of head large, outer edge straight or slightly convex, upper lobe somewhat pointed (fig. 3*a*) ; ratio of width of head to width of peraeon tergite 2 is about 1 : 1.6 ; peraeon tergite 1, antero-lateral projection of epimera short, pointed and with sinuous lateral margin ; tergites 1-2 on specimen with strong tuberosity with large, conical, pointed tubercles along posterior and lateral margins (fig. 3*a*) ; prominent crests developed ; tergite 3 with small bulbous tubercles, tergite 4 with small laterals only, tergites 5-7 smooth ; on small specimens with weak tuberosity tergites 1-2 with small rounded tubercles (fig. 3*b*), no crests developed, tergites 3-7 smooth ; (dental formula, 1, 4-5, 14, 4-5 ; 2, 3-4, 14, 3-4 ; 3, 2-3, 12, 2-3) ; small specimens have only 12 posterior marginal tubercles on tergites 1-3 ; telson triangular with shallow dorsal depression, lateral margins concave (3*g*, *f*) ; telson more pointed in larger specimens ; antenna 2, peduncle segment 2 with small inner lobe ; flagellum about $\frac{2}{3}$ length of peduncle segment 5, flagellum segments sub-equal (fig. 3*e*) ; exopods of pleopod 1 ♂, only weakly sinuous posterior margin, inner angle not pronounced as in *klugii* (fig. 1*c*) ; pseudotracheae well developed on exopods 1-2, small on 3, rudimentary on 4-5.

DISTRIBUTION. Central Asia ; southern Kazakhstan, shores of Aral sea, valley of Syr-darya, region of Golodnaya Steppe, shores of river Ili, Kum-basy mountains ; *crenulatus* type locality in arid hills around lake Inder.

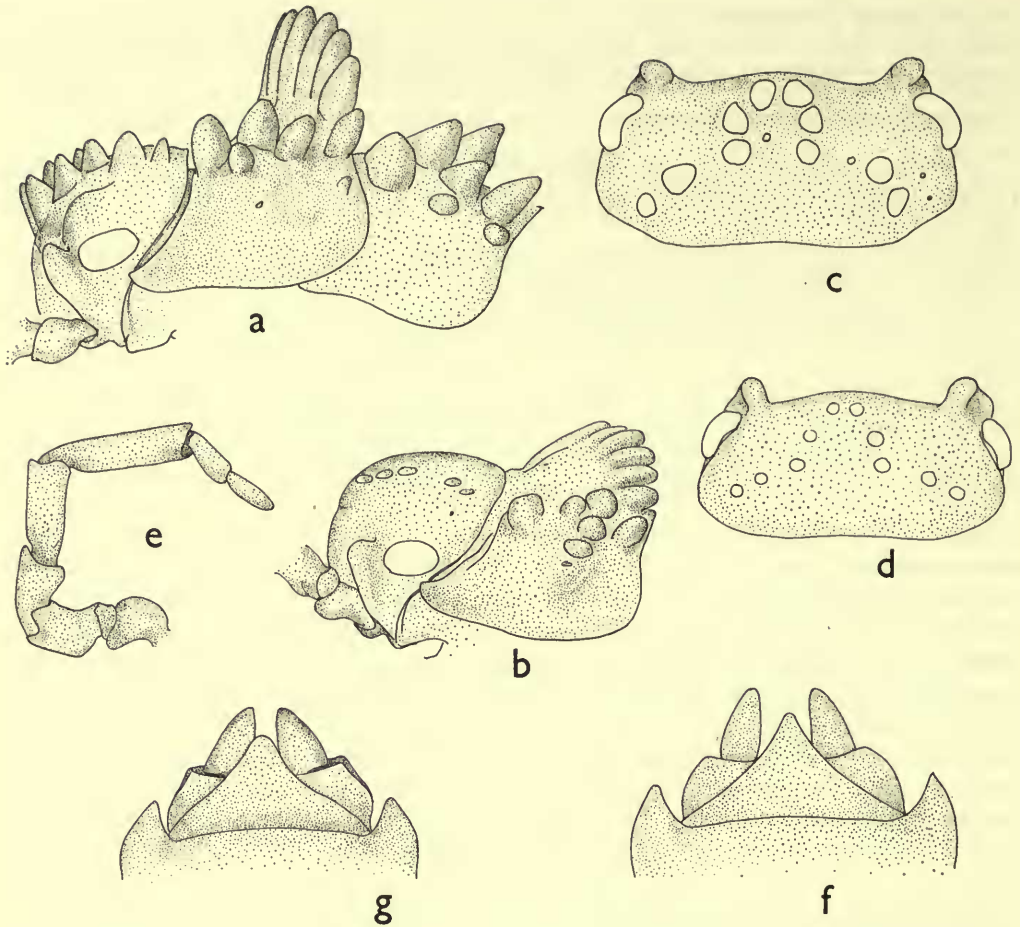


FIG. 3. *Hemilepistus crenulatus* (Pallas) ; a, lateral view of head and tergites 1-2 (large specimen) ; b, lateral view of head and tergite 1 (small specimen) ; c, dorsal view of head (large specimen) ; d, dorsal view of head (small specimen) ; e, antenna 2 ; f, telson (large specimen) ; g, telson (small specimen) ; bar scale 1 mm.

3. *Hemilepistus (H.) reaumuri* (Audouin & Savigny, 1826)
(text-figs. 4a-d)

Porcellio Reaumurii Audouin & Savigny, 1826 : 13 ; Milne-Edwards, 1840 : 170.

Porcellio clairvilli Brandt, 1833 : 179.

Porcellio syriaceus Koch, 1847.

Hemilepistus Reaumurii ; Budde-Lund, 1879 : 4 ; 1885 : 155.

Hemilepistus reamurii ; Dollfus, 1892 : 10 ; 1894 : 3 ; 1896 : 546 ; Richardson-Searle, 1926 : 206 ; Cloudsley-Thomson, 1955 : 248 ; Borutzky : 1958, 1471.

Paraniamba tuberculata Collinge, 1914 : 206

Hemilepistus palaestinus Verhoeff, 1931 : 38.

Hemilepistus bodenheimeri Verhoeff, 1931 : 40.

MATERIAL EXAMINED. 18 ♂♂, 11 ♀♀, length 15–22 mm, width 5.5–8.0 mm. Budde-Lund collection from various localities ; Tunisia, Cyrenaica, Algeria (Biskra and Algiers). B.M. (N.H.).

49 ♂♂, 34 ♀♀, length 17–22 mm, width 6.0–7.5 mm. Various localities and collections from southern Tunisia, Algeria (Biskra), northern Sinai, Negev desert, eastern Egypt (Manyut). B.M. (N.H.)

2 ♂♂, 1 ♀, length 14–16 mm, width 5.0–8.0 mm. Collected by Bodenheimer around Jerusalem, Palestine. B.M. (N.H.), reg. no. 1970, 195.

2 ♂♂, length 20 mm, width 7.0 mm. Syntypes of *palaestinus* Verhoeff, from Palestine. B.M. (N.H.), reg. no. 1931.4.27, 65–67.

13 ♂♂, 13 ♀♀, (17 juveniles), length 16–19 mm, width 6.0–6.5 mm. Syntypes of *palaestinus* Verhoeff ; Verhoeff collection from Jerusalem, Palestine. Munich Museum.

1 ♀, length 15 mm, width 5.5 mm. Syntype of *bodenheimeri* Verhoeff, from Palestine. B.M. (N.H.), reg. no. 1931.4.21, 68.

1 ♂, 4 ♀♀, (3 juveniles), length 10–16 mm, width 4.0–6.0 mm. Syntypes of *bodenheimeri* Verhoeff ; Verhoeff collection from Jerusalem, Palestine. Munich Museum.

1 ♂, 3 ♀♀, length 11–12 mm, width 4.0–5.0 mm. Collected by Verhoeff in Palestine. B.M. (N.H.), reg. no. 1938.7.7, 41–44.

2 ♂♂, 3 ♀♀, length 20–21 mm, width 6.5–7.0 mm. Collected by Verhoeff in Palestine. B.M. (N.H.), reg. no. 1938.7.7, 35–40.

8 ♂♂, 7 ♀♀, length 18–23 mm, width 6.5–8.0 mm. Collection from Algeria (Biskra). Copenhagen Musuem.

DIAGNOSIS. Body broad, length 11–23 mm, width 4.0–8.0 mm, slate grey in colour with lighter grey epimera and whitish tubercles ; head with a large number (25–30) of small, pointed tubercles in a characteristic pattern ; pattern consists of large circle in middle of head, a group of tubercles in postero-lateral corners, and 8–10 tubercles in transverse row along posterior margin (fig. 4b) ; lateral lobes of head prominent, upper lobe rounded, outer edge straight or convex (fig. 4a) ; ratio of width of head to width of peraeon tergite 2 is about 1 : 1.8 ; peraeon tergites 1–3 with large number of small tubercles, never developed into crest ; tubercles in middle of tergites pointed, lateral group somewhat rounded and flattened ; peraeon tergite 1 with posterior marginal row of tubercles, 4 tubercles in transverse median row, and 2 anterior marginal tubercles ; tuberosity on tergites 2–3 similar to that of tergite 1 except no anterior marginal tubercles ; tergite 4 with weak tuberosity ; sometimes faint traces of tubercles on tergites 5–7 ; (dental formula, 1, 10–15, 14–16, 10–15 ; 2, 8–12, 14–16, 8–12 ; 3, 5–8, 14–16, 5–8) ; all tubercles small and number very variable ; telson triangular at base, deep dorsal depression, margins concave, apex acutely rounded (fig. 4d) ; antenna 2, peduncle segment 2 with very large inner lobe ;

flagellum half length of peduncle segment 5 ; flagellum segment 1 markedly longer than 2 (fig. 4c) ; exopods of pleopod 1 ♂, sinuous posterior edge and prominent inner angle as in *klugii* (fig. 1c) ; pleopods pigmented ; pseudotracheae 1-2 large, 3-5 rudimentary.

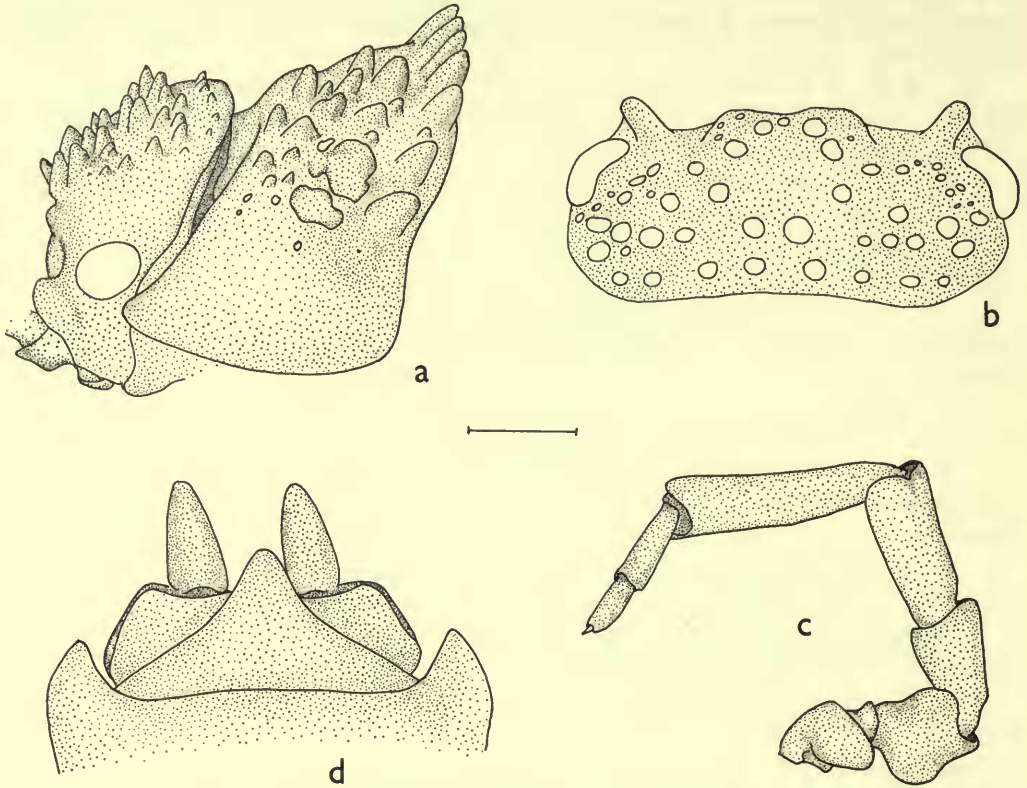


FIG. 4. *Hemilepistus reaumuri* (Audouin & Savigny) ; *a*, lateral view of head and tergite 1 ; *b*, dorsal view of head ; *c*, antenna 2 ; *d*, telson ; bar scale 1 mm.

DISTRIBUTION. Widely spread through Syria, Palestine, Egypt, Libya, Tunisia and western Algeria. According to Vandel (1955) it rarely occurs west of the meridian of Algiers.

REMARKS. Verhoeff (1931) describes two new species of *Hemilepistus* from the neighbourhood of Jerusalem—*palaestinus* and *bodenheimeri*. The diagnosis of *palaestinus* was based upon the stronger armature of tubercles on the head and anterior three peraeon tergites, and the more spinose nature of the tubercles. Syntype material from the Verhoeff Collection in Munich Museum, and from the British Museum (Natural History), was examined together with material collected in many localities in North Africa, Israel and Syria. The degree of development of the tubercles is very variable and as a result of this work *palaestinus* and *reaumurii* are

considered to be a single species. The *bodenheimeri* type specimens are small in size, a greyish brown colour, with white epimera. The tuberosity on the head and first three peraeon tergites is similar to *reaumuri* but only weakly developed. The telson is more triangular in shape than the telson of adult *reaumuri*, although it resembles the telson of small and juvenile *reaumuri*. A triangular telson is typical of the young stages of a number of species of *Hemilepistus*. The above features suggest that the *bodenheimeri* specimens are in fact small individuals of *reaumuri*. Without additional data concerning their distribution they are considered as a single species.

4. *Hemilepistus (H.) cristatus* Budde-Lund, 1879

(text figs. 5a-h)

Porcellio klugii; Lessona, 1867 (not Brandt) : 187.

Hemilepistus cristatus Budde-Lund, 1879 : 4; 1885 : 153; Borutzky, 1945 : 193; 1958 : 1467.

Hemilepistus elegans; Walter, 1889 : 1110.

Hemilepistus crenulatus; Arcangeli, 1932 (part) : 1.

?*Hemilepistus uljanini* Borutzky, 1955 : 216; 1958 : 1469.

MATERIAL EXAMINED. 1 ♂, 1 ♀, length 17 mm, width 5.0 mm. Syntypes *cristatus* Budde-Lund, collected from "Serdschen in Persia". B.M. (N.H.), reg. no. 1956. 10.10, 156-157.

1 ♂, 3 ♀♀, length 17-18 mm, width 4.5-5.0 mm. Norman collection from "Serdschen in Persia". B.M. (N.H.), reg. no. 10443, 46.

2 ♂♂, 12 ♀♀, length 15-19 mm, width 4.5-6.0 mm. No locality. B.M. (N.H.), reg. no. 1970, 197.

DIAGNOSIS. Body long and narrow, length 15-17 mm, width 4.5-6.0 mm, dark grey body, tubercles pale yellow; head with 16-20 short conical tubercles in characteristic pattern within a triangular area; pattern consists of a large circle of 8 tubercles in middle of head, with lateral rows of 3-4 tubercles extending to postero-lateral corners (fig. 5b); sometimes 2-3 tubercles in centre of circle, and a number of smaller tubercles within the triangular area; head tuberosity rather variable (figs. 5c-f), and in an extreme case the pattern is not apparent because the tubercles are poorly developed and flattened (fig. 5f); lateral lobes of head prominent, with rounded apex and sinuous outer edge (fig. 5a); ratio of width of head to width of peraeon tergite 2 is about 1 : 1.5; peraeon tergite 1, antero-lateral projection of epimera long, pointed and upturned at apex (fig. 5a); peraeon tergites 1-3 with well developed tubercles which may form tall upright crests on tergites 1-2; tergite 4 with weak tuberosity, best developed laterally; tergites 5-7 smooth; most anterior tubercle of tergite 1 largest, rectangular; (dental formula 1, 4, 14, 4; 2 & 3, 12, 3); telson triangular, shallow dorsal depression, lateral margins deeply concave, apex acutely rounded (fig. 5g); antenna 2, peduncle segment 2 with large inner lobe; flagellum half length of peduncle segment 5; flagellum segments sub-equal or nearly so (fig. 5h); exopods of pleopod 1 ♂, strongly sinuous posterior margin, inner angle broad and rounded but less prominent than *klugii* (fig. 1c); pseudotracheae on 1-2 large, 3 small, 4-5 rudimentary.

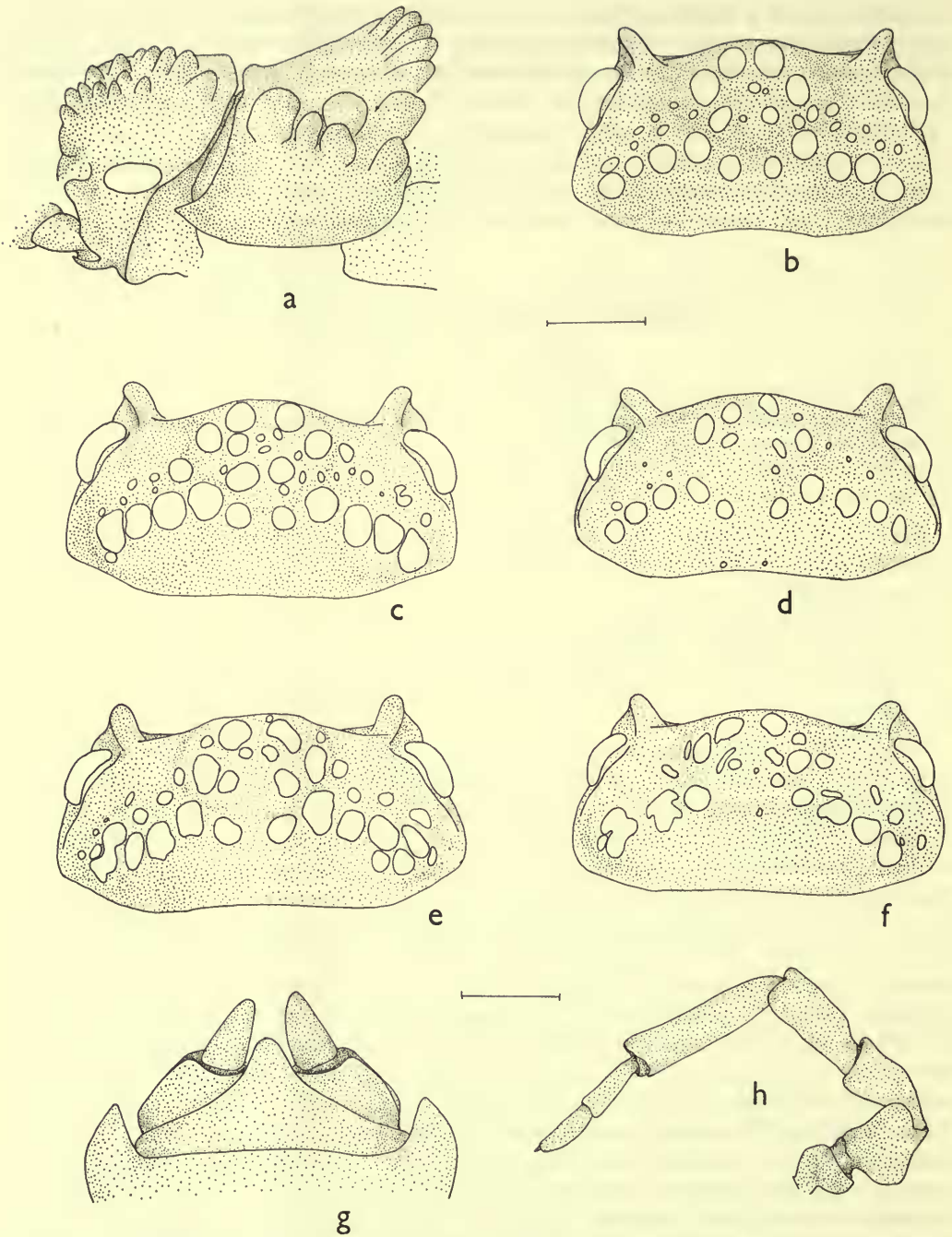


FIG. 5. *Hemilepistus cristatus* Budde-Lund ; a, lateral view of head and tergite 1 (Syntype) ; b, dorsal view of head (Syntype) ; c-f, dorsal view of head ; g, telson (Syntype) ; h, antenna ; 2 (Syntype) ; bar scale 1 mm.

DISTRIBUTION. Iran ; central Asia, slopes of Kopet-Daga from Serakhs to Kazandzhik, valley of Sumbar Uzboy ; Ashkhabad ; type locality Serdscen in Iran.

REMARKS. Borutzky (1955) describes a new species from Turkmeniya—*uljanini*. This seems to differ from *cristatus* only in the detailed tuberosity of the head. However, it is clear that there is considerable variation in the size and arrangement of tubercles on the head of *cristatus* and the description of *uljanini* falls within this range. In other features given *uljanini* and *cristatus* appear to belong to the same species.

5. *Hemilepistus (H.) magnus* Borutzky, 1945

(text-figs. 6a-d)

Hemilepistus (H.) magnus Borutzky, 1958 : 1467.

MATERIAL EXAMINED. 1 ♂, length 26 mm, width 10.5 mm, Budde-Lund collection from Turkmenistan. B.M. (N.H.), reg. no. 1921.10.18, 4146.

DIAGNOSIS. Largest body size for species of *Hemilepistus*, length 26–30 mm, width 9.0–10.5 mm, peraeon nearly uniform in width, tergites 5–7 a little broader than rest ; colour grey ; according to Borutzky (1958) the ventral surface is dark grey with yellow spots ; head with 12–14 long, slender tubercles in characteristic pattern (fig. 6b) ; 6 largest tubercles form an open semi-circle on front of head, with rows of 3–4 tubercles extending to postero-lateral corners ; all tubercles on head very long, slender and rounded at apex ; lateral lobes of head small ; upper part of lateral lobe rounded outer margin concave (fig. 6a) ; ratio of width of head to width of peraeon tergite 2 is about 1 : 2.0 ; peraeon tergite 1, antero-lateral projection of epimera short, rounded ; postero-lateral angle of epimera on tergite 1 forming an acute, backwardly pointing, process (fig. 6a) ; peraeon tergites 1–3 with very long tubercles along posterior and lateral margins ; all tubercles long, slender, cylindrical, and well spaced apart ; tergite 4 with weak tuberosity, tergites 5–7 with traces of tuberosity, best developed laterally ; epimera of tergites 6–7 markedly swollen ; (dental formula 1 & 2 & 3, 3–5, 12–13, 3–5) ; pleon short and broad ; epimera of pleon long, pointed and curved upwards a little at apex ; telson wide at base, long and with acutely rounded apex, margins sinuous (fig. 6d) ; dorsal surface of telson flat or very weakly concave ; antenna 2 strongly developed, peduncle segment 2 with small inner lobe, flagellum half length of peduncle segment 5 ; flagellum slender, segment 2 half length of 1 (fig. 6c) ; exopods of pleopod 1 ♂, sinuous posterior margin and rounded inner angle, but less pronounced than *klugii* (fig. 2c) ; pleopods pigmented.

DISTRIBUTION. Turkmeniya, Fergana valley and the region of the Alayli mountains.

6. *Hemilepistus (H.) reductus* Borutzky, 1945

Hemilepistus (H.) reductus Borutzky, 1945 : 495 ; 1958 : 1468.

MATERIAL EXAMINED. None.

DIAGNOSIS. Body small, elongate, length 13–16 mm, width 4.5–5.0 mm ; dark

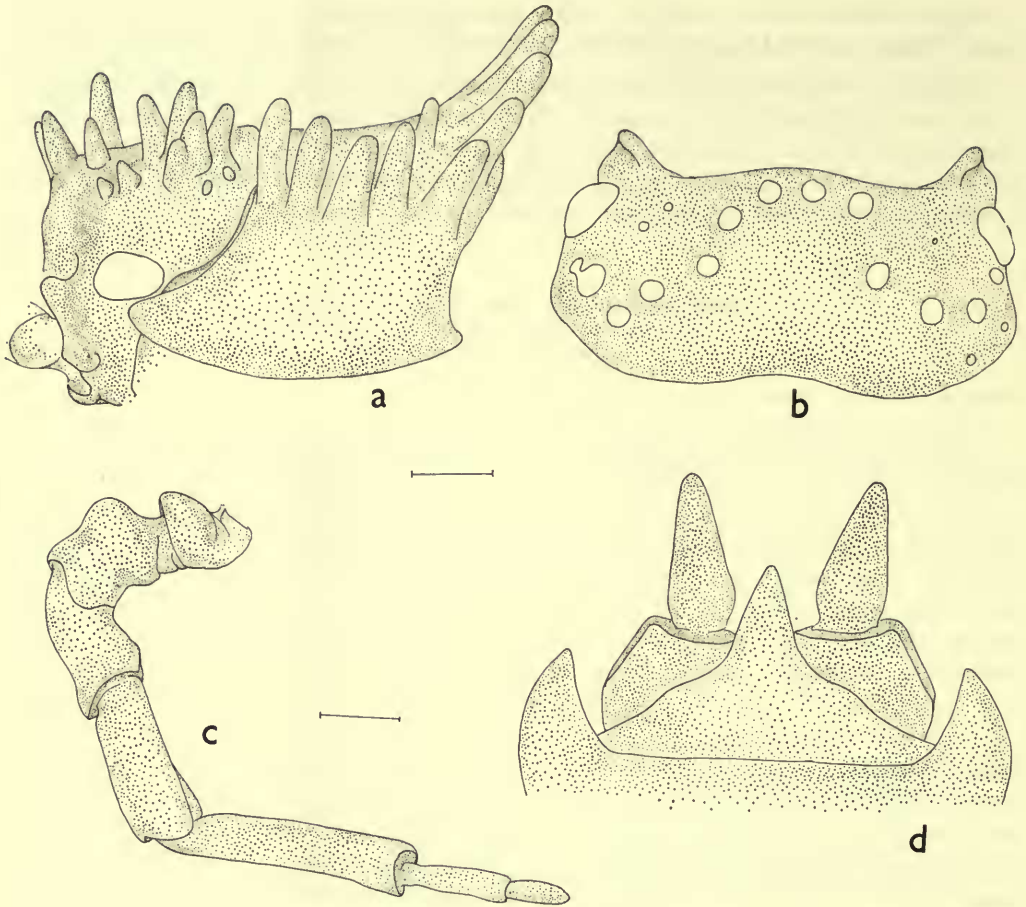


FIG. 6. *Hemilepistus magnus* Borutzky ; a, lateral view of head and tergite 1 ; b, dorsal view of head ; c, antenna 2 ; d, telson ; bar scale 1 mm.

grey with lighter epimeral margins, tubercles whitish in colour ; head with about 12 small tubercles arranged in two curved rows extending from poster-lateral corners of head to an apex at front ; additional smaller tubercles may be present on the head ; lateral lobes of head short, upper edge straight ; ratio of width of head to width of peraeon tergite 2 is about 1 : 1.5 ; tubercles present on posterior and lateral margins of peraeon tergites 1-2 ; tergite 1 with well developed laterals, but posterior row very much reduced in the middle of the tergite ; tubercles on peraeon tergite 2 larger than on tergite 1, uniform in size and closely set together ; tergite 3 with only a trace of lateral tuberosity, posterior margin smooth ; tergites 4-7 smooth ; (dental formula 1, 4-7, 12-16, 4-7 ; 2, 4-7, 10-14, 4-7) ; antenna 2, peduncle segment 5 a little longer than flagellum ; flagellum segments sub-equal ; exopods of pleopod 1 with less sinuous posterior margin than *klugii* (fig. 2c), and no lobe at inner angle.

DISTRIBUTION. Kazakhstan ; Kumak, Kara-darya, the environs of the towns of Katta-Kurgan ; widely distributed in the valley of the river Zeravshan.

7. *Hemilepistus (H.) rhinoceros* Borutzky, 1958

Hemilepistus (H.) rhinoceros Borutzky, 1958 : 1469, fig. 8.

MATERIAL EXAMINED. None.

DIAGNOSIS. Body small, elongate, length 13 mm, width 4.0–4.5 mm, body grey, tubercles white, epimeral margins light grey in colour ; head with a single large tubercle situated in a median position towards the front ; this tubercle is divided on posterior side into two smaller tubercles ; small group of 3–4 tubercles above the eyes ; lateral lobes of head small with rounded upper lobe ; ratio of width of head to width of peraeon tergite 2 is about 1 : 1.3 ; peraeon tergites 1–2 with small conical tubercles directed upwards on tergite 1 and backwards on tergite 2 ; tergites 3–7 smooth, without tuberosity ; (dental formula 1 & 2, 4–5, 12, 4–5) ; telson triangular, apex pointed and lateral margins straight ; antenna 2, peduncle segment 5 one to one and a half times length of flagellum ; flagellum segments sub-equal.

DISTRIBUTION. Kazakhstan ; type locality Dzhusandala near Lake Balkhash in an area of saline loess.

8. *Hemilepistus (H.) aphganicus* Borutzky, 1958

(text-figs. 7a-g)

Hemilepistus (H.) aphganicus Borutzky, 1958 : 1470.

Hemilepistus (H.) aphganicus kabulensis Borutzky, 1958 : 1471.

MATERIAL EXAMINED. 5 ♂♂, 3 ♀♀, length 15–21 mm, width 5.0–7.0 mm. Collected by the Afghanistan Boundary Commission in the region around Bala Murghab, Afghanistan. B.M. (N.H.), reg. no. 86–50.

2 ♂♂, 6 ♀♀, (2 juveniles), length 19–20 mm, width 6.5–7.0 mm. Collected by the Afghanistan Boundary Commission from Serakhs, Turkmeniya, U.S.S.R. B.M. (N.H.), reg. no. 93.2.19, 1–12.

DIAGNOSIS. Body broad, length 15–20 mm, width 5.0–7.0 mm, light brown in colour (in spirit) with pale yellow tubercles ; dry material grey ; peraeon rectangular, tergites 5–7 a little broader than rest ; head with 12–14 long, slender, rounded tubercles in a wide sinuous arc from postero-lateral corners towards the front (fig. 7b, c) ; 2–4 tubercles on centre of head, and row of 4–8 smaller tubercles along posterior margin ; arrangement of tubercles seen clearly in small individuals (fig. 7b) ; large specimens may have a number of additional small tubercles on the head (fig. 7c) ; lateral lobes of head with rounded apex, outer edge sinuous (fig. 7a) ; ratio of width of head to width of peraeon tergite 2 is about 1 : 1.7 ; peraeon tergite 1, antero-lateral projection of epimera long, apex rounded (fig. 7a) ; peraeon tergites 1–3 with long, slender, rounded tubercles along posterior and lateral margins ; middle tubercles in posterior row somewhat smaller than others ; in large individuals, with strongly

developed tuberosity, tergites 1-2 have a tall crest of long, well spaced tubercles, those on tergite 2 larger than those on tergite 1; in small individuals, crests not developed, all tubercles small, equal in size, and directed backwards; tergite 4 with small tubercles, tergites 5-7 smooth; (dental formula 1, 3-6, 14, 3-6; 2 & 3, 3-4, 14, 3-4); telson triangular, short (fig. 7*e*); telson shape varies with body size; figs. 7*f* and 7*g* are taken from 15 mm and 10 mm specimens respectively; at 10 mm stage, telson forms regular triangle, and at this stage head and peraeon tuberosity is just visible in characteristic pattern; antenna 2, peduncle segment 2, with prominent

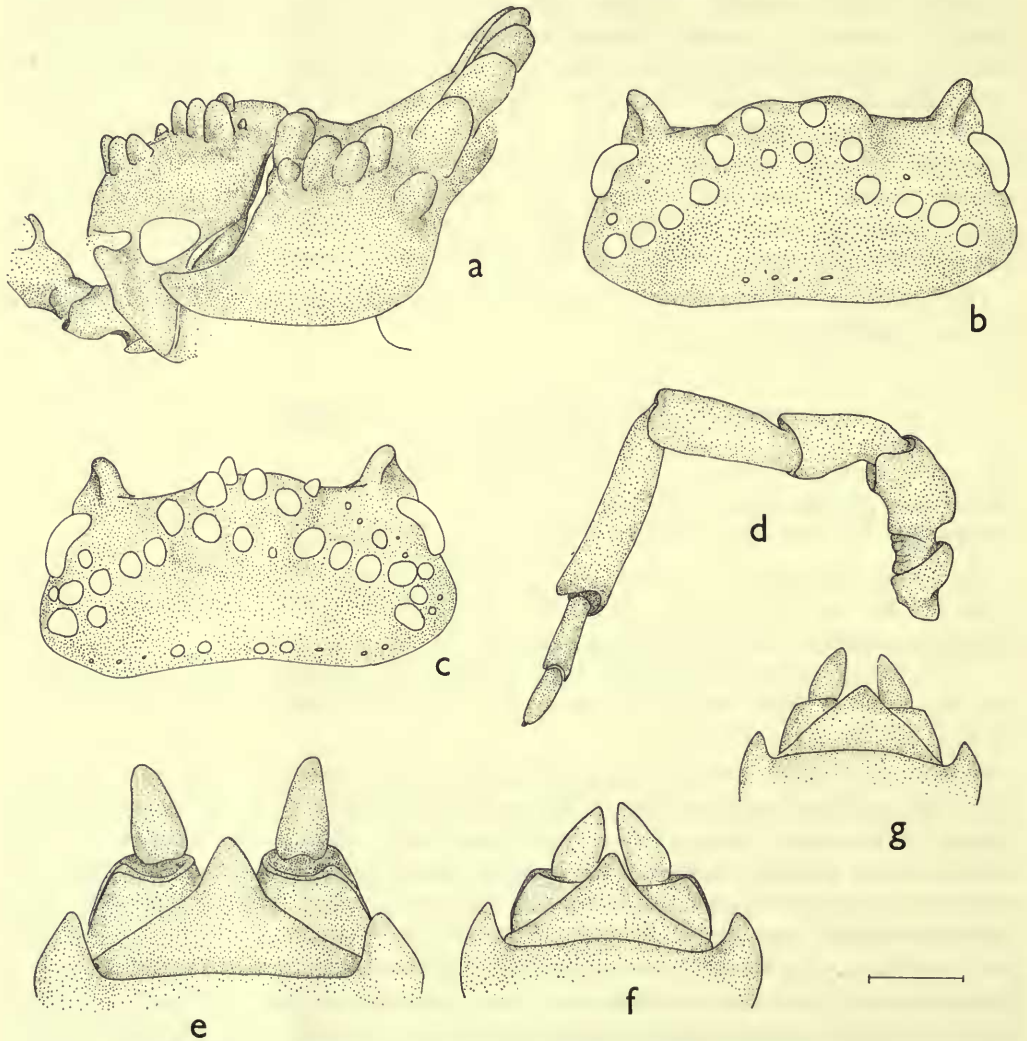


FIG. 7. *Hemilepistus aphganicus* Borutzky; *a*, lateral view of head and tergite 1; *b-c*, dorsal view of head; *d*, antenna 2; *e*, telson (20 mm body length); *f*, telson (15 mm body length); *g*, telson (10 mm body length); bar scale 1 mm.

inner lobe ; flagellum about half length of peduncle segment 5, flagellum segment 1 almost twice length of segment 2 (fig. 7d) ; exopods of pleopod 1 ♂, with markedly sinuous posterior margin and prominent inner angle as in *klugii* (fig. 1c) ; pseudotracheae on exopods 1-2 well developed, 3 small, 4-5 rudimentary.

DISTRIBUTION. Afghanistan ; Turkmeniya, U.S.S.R. ; type locality around Yakatut in Afghanistan.

REMARKS. Borutzky (1958) describes the species *afghanicus* from a small collection of dry material from Afghanistan. He also proposes a sub-species, *kabulensis* for a single female specimen from a locality near Kabul, although he adds that it may not be a valid sub-species because of the large variation between individuals of the species. The examination of the material in the British Museum (Natural History) does not justify the separation of the sub-species on the basis of the description given.

9. *Hemilepistus* (*H.*) *schirasi* n. sp.

(text-figs. 8a-f)

Hemilepistus klugii Budde-Lund, 1885 (not Brandt) : 152 (part).

MATERIAL EXAMINED. 1 ♂, 1 ♀, length 15-17 mm, width 5.5-6.0 mm. ♂ Holotype, ♀ paratype. Collected by Kollar from Shiraz in Iran. Copenhagen Museum.

1 ♂, length 16 mm, width 5.5 mm. Paratype. Collected by Kollar from Shiraz in Iran. B. M. (N.H.), reg. no. 1970 : 199.

1 ♂, length 18 mm, width 6.5 mm. Budde-Lund Collection, from Iran. B.M. (N.H.), reg. no. 1921.10.18, 4142.

DIAGNOSIS. Body broad, length 15-18 mm, width 5.5-6.5 mm, somewhat flattened dorsally ; peraeon almost rectangular, tergite 6 a little broader than rest ; all colouration lost in spirit ; head with 12-14 small, conical tubercles in sinuous line from postero-lateral corners of head towards the front (figs. 8c-e) ; no additional tubercles on head ; lateral lobes of head small, rounded, with concave outer margins (fig. 8a) ; ratio of width of head to width of peraeon tergite 2 is 1 : 1.7 ; peraeon tergite 1, antero-lateral projection of epimera short, rounded and reaching only a little beyond the posterior edge of the eye (fig. 8a) ; peraeon tergites 1-3 with small tubercles along posterior and lateral margins ; outer tubercles somewhat more bulbous than middle ones ; tergite 4 with small lateral tubercles and a trace of posterior marginal ones ; tergites 5-7 smooth, with swollen epimera ; (dental formula 1, 3-4, 14, 3-4 ; 2 & 3, 3, 14, 3) ; telson broad and short (fig. 8f) ; antenna 2, peduncle segment 2, with large inner lobe ; flagellum about half length of peduncle segment 5 ; flagellum segment 1 longer than segment 2 (fig. 8b) ; exopods of pleopod 1 ♂, with strongly sinuous posterior margin and prominent inner angle as in *klugii* ; pseudotracheae on pleopods 1-2 large, 3 small, 4-5 rudimentary.

DISTRIBUTION. The type material was collected by Kollar from Shiraz in Iran.

REMARKS. Budde-Lund (1885), in his monograph on terrestrial isopods, describes three specimens from "Schiras in Persia" as belonging to *klugii*, Brandt. These

specimens have been examined, together with the type material of *klugii* from the Berlin Museum, and it is quite clear that they are separate species. Borutzky (1958) has recognised an error in the diagnosis made by Budde-Lund and has placed "*Klugii* Budde-Lund 1885" in a list of species of doubtful validity, indicating that it may indeed be a new species.

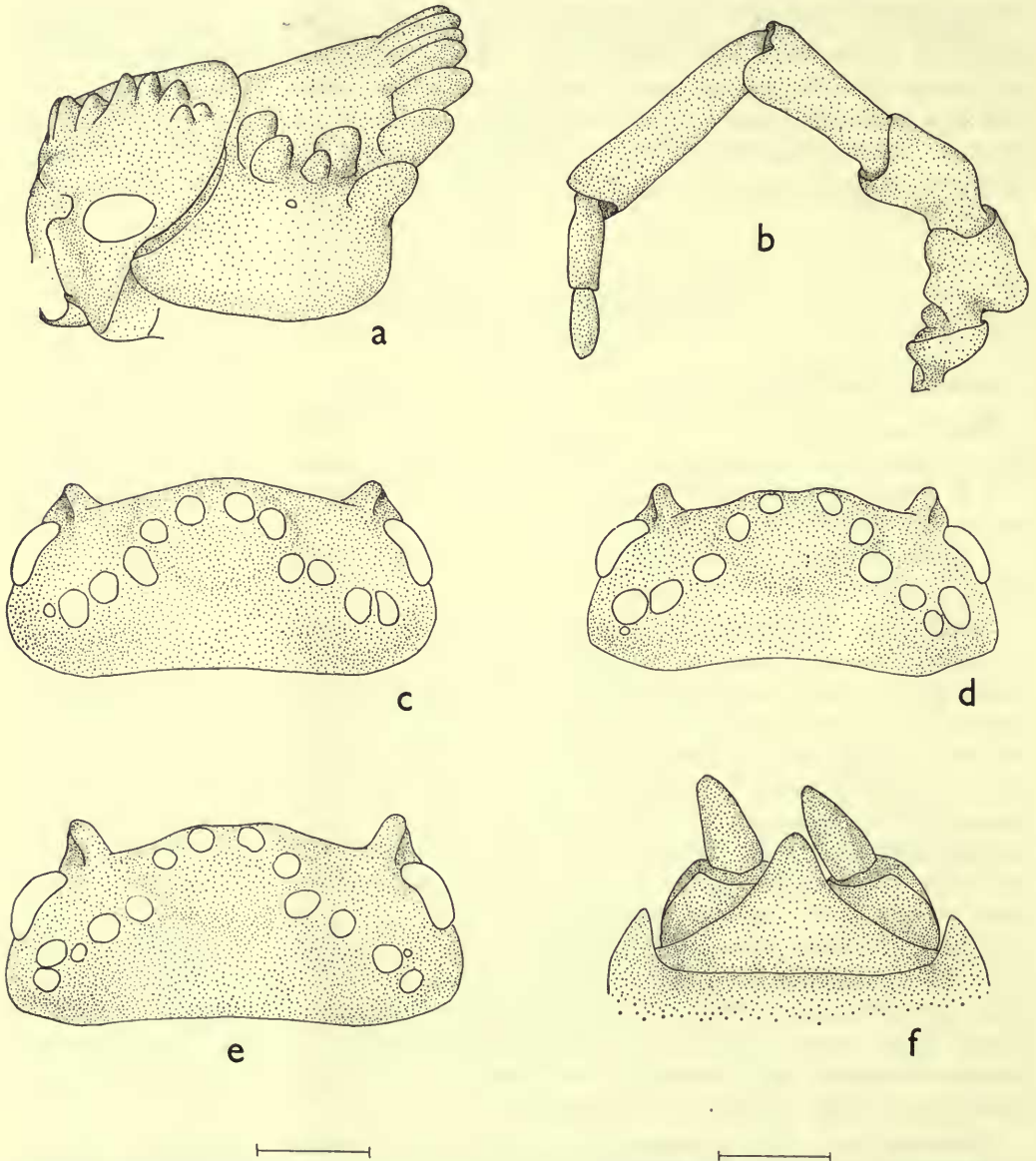


FIG. 8. *Hemilepistus schirasi* n. sp. ; a, lateral view of head and tergite 1 ; b, antenna 2 ; c-e, dorsal view of head ; f, telson ; bar scale 1 mm.

KEY TO THE SPECIES OF *Hemilepistus* (*Hemilepistus*)

- 1 Head with 10 or more tubercles on dorsal surface (2)
 - Head with a single large tubercle at front, and small group of 2-4 tubercles above the eyes **rhinoceros** Borutzky
- 2 Head with 10-16 tubercles in a sinuous line from postero-lateral corners of head towards the front (3)
 - Head with 16-20 large tubercles within a roughly triangular area (7)
 - Head with 25-30 small tubercles, arranged as a large central ring, two postero-lateral groups and a posterior transverse row **reaumuri** (Audouin & Savigny) fig. 4
- 3 Head with 12-16 tubercles in a line from posterior corners of head towards the front ; ratio of width of head to width of peraeon tergite 2 is between 1 : 1.7 and 1 : 2.0 ; flagellum segment 1 distinctly longer than segment 2 (5)
 - Head with 10-12 tubercles in a line from posterior corners of head towards the front ; ratio of width of head to width of peraeon tergite 2 is between 1 : 1.5 and 1 : 1.6 ; flagellum segments sub-equal (4)
- 4 Head, 6 large tubercles forming a semi-circle in middle and 2-3 tubercles in rows extending to postero-lateral corners ; peraeon tergite 1, posterior marginal tubercles not markedly reduced in size from sides to middle **crenulatus** (Pallas) fig. 3
 - Head, 12 tubercles in two curved lines extending from postero-lateral corners to an apex at front ; peraeon tergite 1, postero-marginal tubercles markedly reduced in size from sides to middle **reductus** Borutzky
- 5 Head 12-16 long, slender, pointed tubercles ; large body size, length 18-30 mm (6)
 - Head, 12 small conical tubercles in sinuous line ; small body size, length 14-18 mm **schirasi** n. sp. fig. 8
- 6 Peraeon tergites 1-3 with long, widely separate, pointed tubercles ; traces of tuberosity on tergites 4-7 ; peraeon tergite 1, postero-lateral margin of epimera with backwardly directed process ; very large body size, length 25-30 mm, width 9-10 mm **magnus** Borutzky fig. 6
 - Peraeon tergites 1-4 with prominent, slender tubercles, tergites 5-7 smooth ; peraeon tergite 1, postero-lateral margin of epimera rounded ; large body size, length 18-20 mm, width 6.5-7.5 mm **aphganicus** Borutzky fig. 7
- Peraeon tergites 1-3, tubercles form either an upwardly directed crest or face obliquely backwards, ratio of width of head to width of peraeon tergite 2 is about 1 : 1.5 ; flagellum segments sub-equal ; body size, length 14-19 mm, width 4.0-5.0 mm **cristatus** Budde-Lund fig. 5
 - Peraeon tergites 2-3, apices of tubercles directed backwards parallel to dorsal surface, ratio of width of head to width of peraeon tergite 2 is about 1 : 2.0 ; flagellum segment 1 longer than 2 ; body size, length 18-20 mm, width 8.5-9.0 mm **klugii** (Brandt) fig. 1 & 2

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DR. R. J. LINCOLN
 Department of Zoology
 BRITISH MUSEUM (NATURAL HISTORY)
 CROMWELL ROAD
 LONDON, S.W.7